

Edward C. Edelman

July 10, 2000

1 Q On the second page are tables and the very last
2 line on the second page of Exhibit 45 states:
3 "Table 2 specifies the value — the
4 values of B(c) as a function of inlet
5 guide vane position."
6 Do you see that?
7 A Okay. Yes. Uh-huh.
8 Q Do you recall whether B(c) was determined based
9 upon inlet guide vane position?
10 MR. McCracken: Objection. Asked and answered.
11 THE WITNESS: I would have to look at the —
12 our — our specification to know if that was actually
13 implemented: Which is the system spec since this is
14 just a coordination memo.
15 BY MR. BRAFMAN:
16 Q On the fourth page of Suttie Exhibit 45, at the
17 top is a Turbomeca request for determining the delta
18 P over P setpoint.
19 Do you see that?
20 A Yes.
21 Q Do you recall this request?
22 A Not specifically.
23 Q Do you recall ever considering a delta P over P
24 setpoint similar to what's shown here in Exhibit 45?
25 A I'd have to look at our — our system

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1 you?
2 A Let me read here for a second. Yeah, I don't
3 recall the specifics of this.
4 Q In the first page of Edelman Exhibit 64,
5 there's a reference to defining a pressure ratio of
6 delta P over P (c)?
7 A Yes. Uh-huh.
8 Q Is that the same thing as the B-factor?
9 A No.
10 Q Do you recall what P over P (c) is?
11 A Not — no.
12 Q Do you recall anything about the graph shown on
13 Exhibit 64?
14 A No.
15 Q In the last line right above the graph on the
16 first page of Exhibit 64, there's a reference to the
17 curve delta P over P and in parentheses (W7).
18 Do you see that?
19 A Yes.
20 Q Do you know what that W7 is?
21 A It's a — I believe, yeah, I would only be
22 speculating. I don't recall.
23 Q What's your best recollection?
24 MR. McCracken: Objection. Speculative.
25 THE WITNESS: Corrected compressor discharge

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1 specification to tell you if that's what we implemented.
2 Q So you don't remember?
3 A I don't recall.
4 Q Is there a document that would tell — would
5 tell you what version of software was used in specific
6 APU's sold to customers?
7 A Is there a document? I don't recall.
8 Q Well, if you wanted to find out what versions
9 of softwares were used in various APU serial numbers, do
10 you know how you would find that out?
11 A No.
12 MR. BRAFMAN: I'm going to mark as Edelman
13 Exhibit 64 a two-page document bearing production
14 Nos. HSB 60111 through -112.
15 (Deposition Exhibit No. 64 was marked
16 for identification by the reporter.)
17 BY MR. BRAFMAN:
18 Q Can you identify Edelman Exhibit 64?
19 A Yes. It's a coordination memo from Turbomeca
20 to Sundstrand.
21 Q Did this memo get sent to you?
22 A Yes.
23 Q On approximately October 24, 1994?
24 A Yes.
25 Q Do you recall the reason why this was sent to

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1 flow.
2 BY MR. BRAFMAN:
3 Q So even though this appears to be a graph of
4 delta P over P versus the corrective — the corrected
5 compressor discharge flow, you don't think it's a graph
6 of the B-factors?
7 A No. I mean, it's a different term.
8 Q The first page of Edelman Exhibit 64 refers to
9 this function being a — this P over P (c) being a
10 function of corrected speed and of inlet guide vane
11 setting.
12 Do you see that in the second line?
13 A Yes. Uh-huh.
14 Q Do you recall ever dealing with something that
15 related to corrected speed and inlet guide vane setting?
16 A Not specifically.
17 Q What's this corrected speed end referring to.
18 A It's — it's engine speed corrected to standard
19 day conditions.
20 Q What do you mean by the "engine speed"?
21 A The rotational speed of the engine.
22 Q Which part of the engine are you measuring, its
23 rotation?
24 A Which part of the engine? I mean, there's only
25 one engine speed.

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1 Q Okay. So you don't remember anything about
2 this, why it was sent to you or what you did with it?
3 A No.
4 Q Exhibit 64.
5 A No.
6 MR. BRAFMAN: I'm going to mark as Edelman
7 Exhibit 65 a document bearing production No. HSB 040384.
8 (Deposition Exhibit No. 65 was marked
9 for identification by the reporter.)
10 BY MR. BRAFMAN:
11 Q Can you identify Edelman Exhibit 65?
12 A Yes. It's a coordination memo from me to
13 Turbomeca.
14 Q And after you get a chance to review it, could
15 you summarize the subject being discussed in your memo?
16 A Sure.
17 Yes, okay. So the purpose was to go away from
18 the B-factor because one of the sensors that took into
19 account that calculation was too slow. The time
20 response was — or the time constant was too slow for
21 that calculation to work.
22 So we switched to a different measure of
23 calculation to determine the apex of that curve.
24 Q Was the result of the change being discussed in
25 Edelman Exhibit 65 that you calculated the B-factor

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1 on that?
2 A Yes. I mean, it was driven by — it was a
3 solution recommended by Turbomeca.
4 Q This memo refers to a discussion you had on
5 October 20, 1994.
6 Do you recall who you met with on that day?
7 A No.
8 Q What's Aerospatiale, A-E-R-O-S-P-A-T-I-A-L-E.
9 A Aerospatiale is the — they integrate the
10 entire aircraft. So it would be equivalent of a Boeing.
11 Q So that's your customer?
12 A Yes.
13 Q Is it your recollection that this was your idea
14 or was it Turbomeca's idea to replace the B-factor with
15 this pressure ratio?
16 A I recommended that we needed another solution
17 because the B-factor wasn't working because of this —
18 the problem with the thermocouple sense was too slow.
19 So I asked for another method and they — this
20 memo tells me that they provided me with a different
21 method.
22 Q And you are pointing to Exhibit 64?
23 A Exhibit 64, yeah.
24 Q Is it your understanding that the information
25 in Exhibit 64 relates to the idea of replacing B-factors

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1 differently or did you eliminate the B-factors entirely?
2 A It would — we eliminated it. We replaced it.
3 That's my recommendation anyway.
4 Q What did you recommend replacing the B-factors
5 with?
6 A Load compressor pressure ratio $P7/P2$ as a
7 function of a corrected speed and IGV position.
8 Q What does that mean? What is a load compressor
9 pressure ratio?
10 A It is the exit pressure of the load compressor
11 divided by the inlet pressure of the load compressor.
12 Q So it's the pressure of the air coming out from
13 the compressor divided by the pressure coming in?
14 A Yes.
15 Q How did you — let me rephrase the question.
16 How does that take the place of the B-factor?
17 A It — it's another — it provides you with a
18 unique solution to determine whether you are operating
19 in the choked region or not. Much like the B-factor
20 did.
21 Q The choked region being the region where there
22 is high flow going to the aircraft?
23 A Yes.
24 Q Did you know that that measurement would tell
25 you the information you needed or did someone else work

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1 with load compressor pressure ratios?
2 A Yeah. That's — that's the purpose, is to
3 provide another solution. Uh-huh.
4 Q Is the P over P (c) in Exhibit 64 the load
5 compressor pressure ratio?
6 A Yes.
7 Q Okay. Am I correct that the load compressor
8 pressure ratio is a function of inlet guide vane
9 position?
10 MR. McCracken: Objection. Vague.
11 THE WITNESS: I'd have to see the actual — how
12 we actually implemented that.
13 It's mentioned in this — in this memo but I
14 don't know if that's what we finally ended up with.
15 BY MR. BRAFMAN:
16 Q Okay. But I am interpreting at least your memo
17 in Exhibit 65 correctly that the load compressor
18 pressure ratio that you were recommending to use
19 depended on the inlet guide vane position?
20 A Yes, that's what the memo says.
21 Q Do you recall whether the load compressor
22 pressure ratio was implemented in the APS3200?
23 A No, I don't recall.
24 Q Edelman Exhibit 65 refers to a version 3.0
25 deadline. What does that mean?

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1 A It's a software deadline.
 2 Q And that's the software for the control of the
 3 3200?
 4 A Yes.
 5 Q Who sets the software deadlines?
 6 A It's kind of mutually set by the customer and
 7 Sundstrand.
 8 Q In the bold paragraph, the second to last
 9 paragraph of Edelman 65, you note in the third sentence
 10 that:
 11 "A simple response specifying the
 12 required measured parameters would be
 13 sufficient. The P7/P2 values could be
 14 supplied at a later time."
 15 What does that mean?
 16 A I am just asking them that if we could -- we
 17 could go with this implementation but we don't need the
 18 exact values.
 19 Q What were the parameters that you were asking
 20 for? What does that mean?
 21 A I -- I don't recall.
 22 Q Do you remember whether you received
 23 information necessary for the version 3.0 deadline?
 24 A I don't recall.
 25 MR. BRAFMAN: I'm going to mark as Edelman

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1 A That's a -- a location in the APU.
 2 Q Is there some diagram of the AP with numbers on
 3 it?
 4 A Yes.
 5 Q Do you -- but where would -- where is that?
 6 Where would I find that?
 7 A I'm not sure but there's -- there's a standard
 8 for numbers and their association where they are in the
 9 engine.
 10 Q Is that assumption standard or an industry-wide
 11 standard?
 12 A Industry-wide.
 13 Q What is it you are asking Turbomeca to do in
 14 this memo, Exhibit 66?
 15 A I -- I did a tolerance stack-up of the sensors,
 16 and then asked them if the values in Tables 4 and 5 are
 17 sufficient for calculating the high versus low flow
 18 conditions.
 19 Q Does that mean you were -- you calculated how
 20 this measurement of the compressor pressure ratio would
 21 work in a real APU and you wanted to know whether it was
 22 accurate enough to control?
 23 A Yes. I mean, you have -- you have to consider
 24 stack-up of tolerance of sensor errors to determine if
 25 in a worst-case condition whether it would be sufficient

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1 Exhibit 66 a document bearing production Nos. HSB 40385
 2 through -388.
 3 (Deposition Exhibit No. 66 was marked
 4 for identification by the reporter.)
 5 BY MR. BRAFMAN:
 6 Q Can you identify Edelman Exhibit 66?
 7 A Yes. It's a coordination memo from me to
 8 Turbomeca.
 9 Q Did you write this on or about November 4,
 10 1994?
 11 A Yes.
 12 Q In the first sentence of your memo, you wrote:
 13 "Please find the control system
 14 error analysis for calculation of the
 15 P7/P2(c).
 16 Is the P7/P2(c) the load compressor pressure
 17 ratio?
 18 A Yes. It's corrected load compressor pressure
 19 ratio.
 20 Q C stands for corrected?
 21 A Yes.
 22 Q And again, that's corrected for ambient
 23 conditions?
 24 A Yes.
 25 Q And what's the P7? Why 7?

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1 for control.
 2 Q By stacking up, you mean you add up all the
 3 possible error of the sensors involved?
 4 A Yes.
 5 Q Do you recall the outcome of the analysis
 6 Turbomeca based on your data?
 7 A No.
 8 MR. BRAFMAN: It's about 12:15. Why don't we
 9 break here for lunch.
 10 MR. McCRACKEN: That's fine.
 11 VIDEOGRAPHER: We're going off the record. The
 12 time is 12:18 P.M.
 13 (Lunch recess.)
 14 VIDEOGRAPHER: We're back on the record. The
 15 time is 1:27 P.M.
 16 (Deposition Exhibit No. 67 was marked
 17 for identification by the reporter.)
 18 MR. BRAFMAN: I have marked as Edelman
 19 Exhibit 67 a document bearing production Nos. HSB 110069
 20 through 110103.
 21 Q Can you identify Edelman Exhibit 67?
 22 A Yeah. It's a software definition memo
 23 describing some of the changes made. So it's I guess
 24 the cover sheet is a problem report.
 25 Q So there's a two-page cover sheet regarding a

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1 memo about software that you wrote on February 3, 1993?

2 A Yes.

3 Q And you wrote your memo to Mike Juitte

4 (phonetic)?

5 A Yes.

6 Q Who is that?

7 A He is a software engineer.

8 Q Did he work for you?

9 A No.

10 Q What was his role on the APS3200?

11 A He would take system specifications like this

12 one and then write software.

13 Q How about you, did you write specifications or

14 software, or both?

15 A I did both.

16 Q In this case, in the case of Exhibit 67, you

17 wrote out some specifications and had someone else do

18 the actual coding of it, is that correct?

19 A Yes. In this case.

20 Q What's it that you specified in this memo in

21 Exhibit 67?

22 A It's defined on the third page. The B(c) surge

23 control table looks like it was changed to an adjustable

24 table and then the default values for B(c).

25 Q Let's focus on the first item.

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1 Q Now, the table on 110077 of Exhibit 67

2 corresponds inlet guide vane numbers to be (c); is that

3 correct?

4 A Yes.

5 Q And are those inlet guide vane numbers

6 representative of the position of the inlet guide vanes?

7 A Yes.

8 Q Am I correct, then, that this change in Edelman

9 Exhibit 67 is one in which B(c) will vary depending upon

10 the inlet guide vane position?

11 A Yes.

12 Q Do you recall why the change was made where now

13 B(c) would vary with the inlet guide vane position?

14 A Yeah. I believe because — I don't know the

15 exact reason why B(c) would change.

16 Q What is it you know about the reasons behind

17 the change?

18 A I don't know the reasons behind the change. I

19 don't recall.

20 Q Did someone tell you to implement this change

21 or was it your idea?

22 A I — let's see. Was it my idea? It was

23 defined by Turbomeca.

24 Q Did Turbomeca explain what they were attempting

25 to achieve by suggesting this change, varying B(c) with

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1 What does it mean when you wrote that, "The

2 B(c) table changed to an adjustable table"?

3 A What that means is that it — it allows the

4 software or the systems developer to change variables to

5 see what the effects are in development testing.

6 Q Was the change of — let me take a step back.

7 Is the B(c) is that the B-factor that we talked

8 about earlier today the top of the curve?

9 A Right.

10 Q By making the B(c) table adjustable, was that

11 solely for purposes of development or was that meant to

12 be carried into a commercial APU as well?

13 A To the best of my recollection, when we use the

14 term "adjustable" it's for development purposes.

15 Q Are you able to locate in this document,

16 Exhibit 67, where it's shown how the B(c) table became

17 adjustable?

18 A Okay. Yeah, it's right here. You have it

19 circled.

20 Q Okay. Actually, I didn't — that's how the

21 document came to us I believe.

22 A Okay.

23 Q But in any event, you are referring to the

24 circle's table on page 110077, correct?

25 A Yes.

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1 the inlet guide vane position?

2 A If they did, I don't remember why.

3 Q Was this change — changing B(c) based upon

4 inlet guide vane position carried into a commercial

5 product?

6 A I don't recall.

7 Q On this page of Edelman Exhibit 67, 110077, the

8 bottom right-hand corner it states: "APS3200 software

9 version 0.1.7."

10 Do you see that?

11 A Yes.

12 Q Do you know whether that was a developmental

13 pre-release software version?

14 A Yeah. The number would indicate that.

15 Q Is it the zero that tells you it was not a

16 release?

17 A Yes.

18 Q And does the zero, in fact, tell you that this

19 is before there was ever a commercially sold APS3200?

20 A Yes.

21 Q Were all software versions prior to 1.0 solely

22 developmental?

23 MR. McCracken: Objection. Vague.

24 THE WITNESS: I don't recall.

25 BY MR. BRAFMAN:

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1 Q Would you refer to this as a schematic or block
2 diagram?
3 A Yeah. It's a logic block diagram.
4 Q Logic block diagram.
5 Is the place where the inlet guide vane -- let
6 me rephrase the question.
7 Is the place in the logic diagram where the
8 B(c) is varying within that guide vane position shown at
9 the bottom left-hand corner with the IGV POS line going
10 into a little graph?
11 A Yes.
12 Q IGV POS stands for inlet guide vane position?
13 A Yes.
14 Q Is this the logic diagram on -- in Edelman
15 Exhibit 67 for the entire control of the bleed control
16 valve?
17 A Yes. Uh-huh.
18 Q On the left hand most side of this page,
19 HSB 110077, it shows delta P over P; is that correct?
20 A Yes.
21 Q And below that is the delta P over P setpoints
22 labeled SRGSPT?
23 A Yes.
24 Q Is there somewhere where that surge setpoint is
25 defined?

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1 THE WITNESS: Yeah, I would have to say no.
2 Does it take control? What it does is it just purely
3 sets the valve position to full open. I really wouldn't
4 consider that to control. But an open loop setpoint.
5 BY MR. BRAFMAN:
6 Q Open loop refers to the position on the valve?
7 A Yes. It just tells the valve to go to a
8 position rather than a close loop control.
9 Q Is that shown on the diagram?
10 A Yeah. It shows -- when this switch is set
11 to 1, the output value is K surge max. KSRGMX. And
12 that's defined in the control gain table as 5.0, and
13 that's the voltage output for the maximum position.
14 Q Can you -- I'll hand you a pen -- circle the
15 switch you are referring to?
16 A Right here.
17 Q Am I correct that the little line, the
18 horizontal line in that switch is showing the logic from
19 the delta P over P side is controlling but that if the
20 flow were to determined to be high the switch would turn
21 vertical in the diagram?
22 A Yes.
23 Q Does Edelman Exhibit 67 refresh your
24 recollection about whether the setpoints with the two
25 numbers for different gains had been dropped by this

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1 A Yes. It's in the control gain table. Shows
2 0.2.
3 Q Do I understand correctly then that in this
4 version of the control for the bleed control valve the
5 surge setpoint was a single number?
6 A Yes.
7 Q How does the logic that begins with the delta
8 P over P, and it continues across the page, relate to
9 the logic that begins at the bottom that includes the
10 inlet guide vane position?
11 A The logic at the top of the page is the PI
12 control. The logic at the bottom of the page is
13 B-factor logic.
14 Q How do they interact?
15 A What happens is that the surge control logic is
16 overwritten if the logic gate output of the B-factor is
17 high, if that signal is high, which corresponds to high
18 flow.
19 Q Is the logic gate you are referring to for the
20 B-factor the box labeled "latch"?
21 A Yes.
22 Q If the bottom logic shows there to be a high
23 flow, it takes control of the bleed control valve?
24 MR. McCracken: Objection. Ambiguous. And
25 vague.

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1 point?
2 A I don't know if this came before or after. Let
3 me see here. No, this has -- this has the high-gain
4 logic which is right here.
5 So if delta P over P is less than a given
6 value, then it switches the proportional gain to a
7 higher value which you see that right here.
8 Q So you are now within the box labeled "PID
9 surge control" at the top?
10 A Yes.
11 Q Can you show me where the -- okay. So the box
12 labeled "surge SPL" is the setpoint for low gain; is
13 that what it stands for?
14 A That is that lower setpoint of .17 that we
15 discussed before.
16 Q Okay. And what does the next box "CTR" stand
17 for?
18 A There's a counter that it has -- because of --
19 to prevent cycling because of noise, you want to make
20 sure you have a number of counts before you declare that
21 lower than the value. It's called D bounce logic.
22 Q Okay. Do you know whether the delta P over P
23 setpoint in the APS3200 was ever designed to vary with
24 temperature?
25 A Was the delta P over P -- not that I recall.

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1 MR. BRAFMAN: I'm going to mark as Edelman 68 a
2 document bearing production No. HSA 211392 through -393.
3 (Deposition Exhibit No. 68 was marked
4 for identification by the reporter.)
5 BY MR. BRAFMAN:
6 Q Is Exhibit 68 another coordination memo between
7 Sundstrand and Turbomeca?
8 A Yes.
9 Q Do you recall this particular coordination
10 memo?
11 A Let me read it here. I don't recall it exactly
12 but I mean --
13 Q The information within it is familiar to you?
14 A Yeah.
15 Q The first page of Edelman Exhibit 68 refers to
16 inlet guide vane setting versus inlet temperature?
17 A Yes.
18 Q What is that referring to?
19 A It doesn't seem to make sense to me. I don't
20 know exactly what the table is for. I don't know.
21 Q Do you ever recall dealing with some kind of
22 comparison between inlet guide vane settings and inlet
23 temperature?
24 A I don't recall.
25 Q What does the ECS demand refer to in Edelman

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1 Exhibit 69 a document bearing production Nos. HSA 211155
2 through -156.
3 (Deposition Exhibit No. 69 was marked
4 for identification by the reporter.)
5 BY MR. BRAFMAN:
6 Q Is Edelman Exhibit 69 another coordination memo
7 between Sundstrand and Turbomeca?
8 A Yes.
9 Q Do you recall ever receiving this coordination
10 memo, Exhibit 69?
11 A Not to my recollection.
12 Q On the second page of Edelman Exhibit 69, under
13 the heading "Delta P over P setpoint," it's stating,
14 "Surge line will vary in flight with IGV setting angle
15 alpha."
16 Do you know what that refers to?
17 A No.
18 Q Do you know what the surge line is?
19 A Yeah. I know what -- I know what a surge line
20 is.
21 Q What's a surge line?
22 A That's where -- the point where the engine will
23 go into surge.
24 Q Is it your understanding it's the point where
25 the engine will go into surge changes depending upon the

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1 Exhibit 68?
2 A That's the environmental control system in the
3 aircraft.
4 Q Is there a percent ECS demand would mean that
5 the aircraft isn't asking for air for the air
6 conditioning?
7 A That's correct.
8 Q Who is P. Marconi listed as the author of
9 Exhibit 68?
10 A I don't recall.
11 Q When you indicated that the information in
12 Exhibit 68 was familiar to you, what were you referring
13 to?
14 A I know that we did change IGV position as a
15 function of ECS demand. I don't see -- I don't see
16 where temperature is involved though.
17 Q Were you involved in the control of the inlet
18 guide vane positions?
19 A I would -- I would pass the requirements on to
20 the software group.
21 Q You didn't work on the control yourself?
22 A No. We would -- we would get a schedule from
23 Turbomeca and then I would put it into a specification,
24 and it would get coded in software.
25 MR. BRAFMAN: I'm going to mark as Edelman

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1 inlet guide vane position?
2 A I don't recall. I'd have to see a surge map to
3 refresh my memory.
4 Q On the first page of Exhibit 69, one of the
5 recipients of this memo is listed as P., somebody. Can
6 you tell who that is at the top?
7 A No.
8 Q At the bottom, on the distribution list for
9 Sundstrand are two names. Can you tell me they are?
10 A Yeah. It's Korosh and Terry Meche.
11 Q Above that there's three boxes crossed:
12 "Distribution Turbomeca," "Distribution to SPS" and
13 "Distribution to Apeg."
14 Do you see that?
15 A Yes.
16 Q In the SPS box it looks like Cuddi?
17 A Suttie.
18 Q Suttie. Can you read the name under that?
19 A I -- I believe it's Macarez.
20 Q Who is that?
21 A He was our liaison but I'm not -- it's kind of
22 difficult to read.
23 Q Your liaison with Turbomeca?
24 A You know -- strike that. I don't know who -- I
25 don't recognize it. It's too difficult to read.

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1 Q You mention this Macarez was a liaison.
 2 Liaison to whom?
 3 A Macarez worked for Turbomeca. But he was
 4 located in our facility.
 5 Q What did he do?
 6 A Nothing much. Yeah, I'm not sure what he did.
 7 MR. BRAFMAN: Okay. I'm going to mark as
 8 Edelman Exhibit 70 a document bearing production
 9 Nos. HSB 370093 through 370147.
 10 (Deposition Exhibit No. 70 was marked
 11 for identification by the reporter.)
 12 BY MR. BRAFMAN:
 13 Q Can you identify Edelman Exhibit 70?
 14 A Yes. It's software C code for calculation of
 15 the -- well, it says P-factor.
 16 Q Do you know what the P-factor is?
 17 A No. I'd have to read through.
 18 Q And flipping through the document, it appears
 19 to be C code for a number of different modules?
 20 A Yes. Quite a few different.
 21 MR. McCracken: David, I want to at this point
 22 note that the document appears to have revisions that
 23 are dated as late as July of 1996, and I don't recall
 24 the witness's testimony as to when he left the employ of
 25 the company.

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1 A Yeah. It looks like that I took one C file and
 2 broke them up into two.
 3 Q Do you recall the circumstances in which you
 4 did that?
 5 A No.
 6 MR. BRAFMAN: I'm going to mark as Edelman
 7 Exhibit 71 a document bearing production Nos. HSA 226735
 8 through -776.
 9 (Deposition Exhibit No. 71 was marked
 10 for identification by the reporter.)
 11 BY MR. BRAFMAN:
 12 Q Can you identify Edelman Exhibit 71?
 13 A Yes. It's a presentation for an in-service
 14 review meeting for the APS3200 bleed system.
 15 Q What's an "in-service review meeting"?
 16 A That means that -- that we're in production at
 17 this point.
 18 Q How does it mean that?
 19 A Well, that's the implication of the word
 20 "in-service."
 21 Q You take "in-service" to mean that the engine
 22 is in production?
 23 A Yes.
 24 Q Did you have in-service review meetings on a
 25 regular schedule?

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1 My concern is simply one of confidentiality.
 2 And to the extent that this discloses something that he
 3 is not aware of or has been made aware of during the
 4 course of his employment, then we want to be careful
 5 under the protective order.
 6 MR. BRAFMAN: Okay. Then I'll refrain from
 7 taking him through the details.
 8 Q Have you ever printed out all the software used
 9 in the 3200?
 10 A All of the software?
 11 Q Yeah. I'm trying to get a sense as to whether
 12 you think this Exhibit 70 is all or the bulk of the 3200
 13 software. Is there a way you can tell?
 14 A No. It's not even close.
 15 Q Not even close.
 16 A This is a very small portion.
 17 Q The -- if you look on the front page of
 18 Exhibit 70 in the revision history on the first line
 19 dated January 9, 1995 your name appears.
 20 A Yeah.
 21 Q With the description, "Initial release."
 22 A Yes.
 23 Q And the description continues "Break up of
 24 module calc surge setpoints."
 25 Do you recall what that means?

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1 A I don't recall what the schedule was. I do
 2 remember one or two of these.
 3 Q So it wasn't as if it was weekly or monthly?
 4 A Yes.
 5 Q Do you recall giving this presentation,
 6 Edelman 71?
 7 A Not exactly.
 8 Q If you turn to the page 4 of Edelman 71, am I
 9 correct that this presentation related to the problems
 10 you were having in detecting surge? And looking further
 11 at page 6 and 7 might assist you as well.
 12 MR. McCracken: Could you reread the question,
 13 please?
 14 (Following record was read:
 15 "QUESTION: If you turn to the
 16 page 4 of Edelman 71, am I correct that
 17 this presentation related to the
 18 problems you were having in detecting
 19 surge? And looking further at page 6
 20 and 7 might assist you as well.")
 21 THE WITNESS: Yeah, I don't see any -- page 4
 22 doesn't really address anything about problems with
 23 surge.
 24 BY MR. BRAFMAN:
 25 Q Well, I was looking at the first paragraph that

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1 starts: "Inadequate surge fault detection." But why
 2 don't I just ask you outright.
 3 A Okay.
 4 Q Do you recall what the issues were that were
 5 being addressed by your presentation?
 6 A Well, this looked -- the first point looks like
 7 a problem with the sensor failure. The sensor was not
 8 reading properly and would cause the engine to surge.
 9 Q Why were you addressing the B-factor on page 6
 10 of your presentation?
 11 A I don't know. I can't recall.
 12 Q On page 7, you refer to removing delta P over P
 13 being less than KR1.
 14 What does that mean?
 15 A Yeah, I don't know what KR1 is. I don't
 16 recall. It's shown here in this graph a value -- delta
 17 P over P .15. So it's -- it's an indication of the
 18 surge line.
 19 Okay. Yeah, it's -- it's a fault that's
 20 declared if your delta P over P is less than .15. But
 21 because of dynamics associated with the T1cd low
 22 compressor discharge temperature, it would result in
 23 miscalculation of B-factor and result in a false --
 24 fault declaration.
 25 Q Is it your understanding that as of the time of

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1 Q In Exhibit 9?
 2 A Yes.
 3 Q And all the names that appear below yours are
 4 people who approved the specification that you wrote?
 5 A Yes.
 6 Q Who are these individuals? Who's H. Smith?
 7 A He's a checker. He would check the document to
 8 make sure there's no inaccuracies with regards to
 9 references and...
 10 Q So internal consistency?
 11 A Yes.
 12 Q Who is W. Pierce?
 13 A He was a project engineer. William Pierce.
 14 Q Did he work with you or for you?
 15 A Yeah, he worked with me.
 16 Q Did he have tasks that he focused on that were
 17 different than yours?
 18 A Yeah. He was in the program office so, yeah.
 19 Q And M. Covick?
 20 A Matt Covick. He's a quality engineer.
 21 MR. McCRACKEN: David, for the record, also
 22 this document appears to be dated subsequent to the
 23 witness's date of termination of employment with
 24 Sundstrand.
 25 And so I would simply ask that we pursuant to

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1 your presentation, December of '94, the commercially
 2 sold APS3200s were using the B-factor in its control of
 3 the bleed control valve?
 4 A Yes. That's what this would imply.
 5 Q And does your presentation in Edelman 71 relate
 6 to the move towards the low compressor pressure ratio
 7 instead of B-factors?
 8 A Yes. That was -- that was the evolution of it,
 9 of the logic.
 10 Q I'm going to hand you what's previously been
 11 marked as Suttie Exhibit 9 bearing production numbers as
 12 HSA 96782 through 96965.
 13 A Okay. Thank you.
 14 Q Can you identify Suttie Exhibit 9?
 15 A Yeah. It's a systems requirement
 16 specification.
 17 Q Is this the specification you referred to
 18 several times earlier today?
 19 A Yes.
 20 Q On the second page of Suttie Exhibit 9 your
 21 name appears under -- by the "Preparer" line for this
 22 specification?
 23 A Yes.
 24 Q Does that mean you wrote this specification?
 25 A Yes.

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1 the protective order be careful not to disclose anything
 2 of confidence to this witness that he may not have been
 3 privy to.
 4 And specifically, I'm referring to the dates,
 5 what appear to be dates in the lower left-hand corner of
 6 several documents that follow, at most, if not all have.
 7 Could we go off the record for a moment?
 8 MR. BRAFMAN: Sure.
 9 VIDEOGRAPHER: We're going off the record. The
 10 time is 2:06 P.M.
 11 (Recess)
 12 VIDEOGRAPHER: We're back on the record. The
 13 time is 2:23 P.M.
 14 BY MR. BRAFMAN:
 15 Q Do you know how the APS3200 controls work
 16 today?
 17 A No.
 18 Q When you come out with a new software revision
 19 for the APS3200, does that get inserted into APS3200s
 20 already out in the world?
 21 A I don't know the answer to that question.
 22 Q We've mentioned integral control a few times.
 23 Does that refer to in part being a function of time?
 24 A Yeah.
 25 Q Did the engines that you worked on while you

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1 were at AlliedSignal, Honeywell's predecessor, did they
 2 have bleed valve control?
 3 A No.
 4 Q Did the -- did you do any work on surge or
 5 bleed valve control while at AlliedSignal?
 6 A Yeah, I take that back. We did -- we did have
 7 surge bleed valves.
 8 Q Did you do any work with respect to the surge
 9 bleed valves while you were at AlliedSignal?
 10 A Yes.
 11 Q What did you do concerning surge bleed valves
 12 at AlliedSignal?
 13 A On the TFE731 main engine unit we had a three-
 14 position bleed valve that we would open up in the event
 15 that we were approaching the surge line.
 16 Q Who did you work with on that project?
 17 A Project engineering group. I don't have
 18 specific names.
 19 Q What do you recall of the logic used in
 20 controlling the bleed valve on that AlliedSignal engine?
 21 A It was two-spool engine. So I know that it was
 22 a fuel flow as a function of N1 and N2 which are the two
 23 spool speeds. If the fuel flow exceeded a given amount
 24 then we would open the bleed valve.
 25 Q So the bleed valve control depended on fuel

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1 Q Did Sundstrand have any difficulty with high
 2 altitude starts on 3200 that you are aware of?
 3 A No. It -- it took some extra development time
 4 but we didn't have a problem with high altitude starts.
 5 Q What was the issue that required extra
 6 development time?
 7 A Altitude testing. So it was a significant
 8 amount of labor. Either it entailed flight testing or
 9 going to an altitude test facility.
 10 Q Is -- I should ask you this, high altitude
 11 means -- let me just ask you.
 12 What is high altitude starting up -- startups?
 13 A Well, there was -- there was a -- an altitude
 14 limit, and I don't recall what the limit was.
 15 Q An altitude limit for what?
 16 A That the APU had to start. There was an
 17 envelope.
 18 Q So just the APU itself had to be able to turn
 19 on or start at altitudes up to a certain limit?
 20 A Yes.
 21 Q What makes it difficult to start an APU at a
 22 high altitude?
 23 A The air density makes it very difficult. The
 24 combustion is very difficult at high altitude.
 25 Q Is the control of the bleed valve at all

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1 flow?
 2 A Yes.
 3 Q Did the TFE731 have adjustable inlet guide
 4 vanes?
 5 A I don't recall.
 6 Q Do you recall working on any other projects
 7 relating to a surge bleed valve at AlliedSignal?
 8 A No.
 9 Q Sitting here today, are you familiar with any
 10 of Honeywell's APUs?
 11 A No.
 12 Q And by Honeywell, do you understand that I mean
 13 the old AlliedSignal and the old Garrett?
 14 A Yes.
 15 Q Do you know anything about the Honeywell 36300
 16 APU?
 17 A No.
 18 Q Have you ever heard of it before?
 19 A No.
 20 Q Have you ever heard of the Honeywell 131-9
 21 series APUs?
 22 A No.
 23 Q Have you ever heard of the Honeywell 350 series
 24 APUs?
 25 A No.

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1 implicated in starting an APU at a high altitude?
 2 A No.
 3 Q Is it the customer that specifies the altitude
 4 at which the APU must start?
 5 A Yes.
 6 Q Were you at all involved in attempts to sell a
 7 sensor to APU Boeing?
 8 A Yes. Very briefly.
 9 Q When was that?
 10 A I can't give you an exact year.
 11 Q Beginning of your --
 12 A 1994. '95. Somewhere in there.
 13 Q What APU was Sundstrand attempting to sell to
 14 Boeing?
 15 A Yeah. I don't -- I don't recall. I can't -- I
 16 can't remember.
 17 Q Could it have been the 3200?
 18 A Yeah. I think -- yeah, I -- could have been.
 19 Q Do you think it was?
 20 A Yeah, I think that with some modifications. I
 21 don't remember the exact details.
 22 Q Do you know why that effort failed?
 23 MR. McCracken: Objection. It assumes a fact
 24 not in evidence.
 25 THE WITNESS: Why did it fail?

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1 BY MR. BRAFMAN:

2 Q Yes.

3 A There was a competition between AlliedSignal
4 and Sundstrand. AlliedSignal won the competition.5 Q Do you know any of the reasons why Boeing
6 picked AlliedSignal over Sundstrand?

7 A No.

8 Q Do you know what APU AlliedSignal had proposed
9 to Boeing in competition to the Sundstrand APU?

10 A No.

11 Q Have you ever seen any documentation regarding
12 any aspect of the operation of a Honeywell APU?

13 A No.

14 Q Do you know whether Sundstrand or Turbomeca
15 ever analyzed a Honeywell APU?

16 A No.

17 Q Do you know whether Sundstrand or Turbomeca
18 ever had access to technical information about Honeywell
19 APU?

20 A No.

21 Q Does any Sundstrand APU other than the APS3200
22 have adjustable inlet guide vanes?

23 A Not that I can recall.

24 Q Are you familiar with the KC135 APU?

25 A No.

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1 Q Are you familiar with the JAS 39 APU?

2 A Yes.

3 Q What is the JAS 39?

4 MR. McCracken: Objection as to relevance.
5 And so that I don't keep interrupting you,
6 David, I'll just make a standing objection to the line
7 of questioning regarding APU is not an issue in this
8 lawsuit.

9 MR. BRAFMAN: That's fine.

10 THE WITNESS: The JAS 39. I believe it was a
11 for a Swedish military fire. Not a hundred percent
12 sure.

13 BY MR. BRAFMAN:

14 Q Do you know whether that APU, the JAS 39, had
15 adjustable inlet guide vanes?

16 A No.

17 Q Do you know anything about the control of the
18 bleed valve in that APU?

19 A No.

20 Q How did you hear of the JAS 39 before?

21 A It was a program that was being pitched. The
22 engine was never built or -- so there were a number --
23 there were a group of people that would work on it from
24 time to time.

25 Q Were you one of those people?

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1 A No.

2 Q When did you first hear of this lawsuit?

3 A I was called by a Sundstrand manager. He
4 called me. His name was Doug Martin.5 Q When did Mr. Martin call you about this
6 lawsuit?

7 A I'd say it was approximately two years ago.

8 Does that make sense? I'm not sure. One to two years.

9 Q Why did Mr. Martin call you about the lawsuit?

10 A He mentioned that I may be involved.

11 Q Did he say why he thought you would be
12 involved?

13 MR. McCracken: Objection. Hearsay.

14 THE WITNESS: No. I didn't know the specifics
15 back then.

16 BY MR. BRAFMAN:

17 Q What did Mr. Martin tell you about the lawsuit?

18 MR. McCracken: Standing objection to hearsay
19 as to this line of questioning.

20 THE WITNESS: I can't recall the specifics.

21 BY MR. BRAFMAN:

22 Q About how long did the conversation with
23 Mr. Martin last?

24 A Fifteen minutes.

25 Q Did Mr. Martin tell you what AlliedSignal or

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1 Honeywell was claiming in the lawsuit?

2 A Not that I can recall.

3 Q Did Mr. Martin ask you any questions about the
4 operation of the APS3200 operation?

5 A No.

6 Q Did Mr. Martin tell you to do anything as a
7 result of Honeywell bringing the lawsuit.

8 A Did he tell me to do anything? No.

9 Q Did he -- did he call for any reason other than
10 just to tell you that the lawsuit existed?11 A He did -- he did mention that there were
12 Sundstrand lawyers that would like to talk to me.

13 Q Did you talk to them?

14 A Yes. Uh-huh.

15 Q Was that the same phone call you talked about
16 earlier today?17 A Well, there was a meeting first. And then
18 later came a phone call from -- from Tom Miller. But
19 this meeting took place six months to a year ago.

20 Q Who did you meet with at the meeting?

21 A I actually don't remember their names.

22 Q Did you -- were any of the people at the
23 meeting someone you knew from before?

24 A No.

25 Q Were they all lawyers?

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1 A Yes.
 2 Q Where was the meeting?
 3 A It was in Woodland Hills, California.
 4 Q Do you know what law firm the lawyers were
 5 from?
 6 A No.
 7 Q Were those lawyers representing you at the
 8 time?
 9 A No.
 10 Q What was it you talked about with the lawyers?
 11 MR. McCracken: Objection. This witness has
 12 since agreed to be represented by the lawyers who meant
 13 with him earlier, and I would ask that the question be
 14 withdrawn or else I will be forced to ask the witness
 15 not to answer the question.
 16 MR. BRAFMAN: Well, the witness wasn't
 17 represented at the time and the privilege isn't
 18 retroactive.
 19 MR. McCracken: Will you withdraw the question?
 20 MR. BRAFMAN: No.
 21 MR. McCracken: Before the witness answers, the
 22 discussions that were held or that might have been held
 23 at the time were with the witness between the witness
 24 and a lawyer and who subsequently was requested to
 25 represent the witness.

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1 Q Is it your understanding it's a patent
 2 infringement lawsuit?
 3 A That's what I understand, yes.
 4 Q Have you ever seen any of Honeywell's patents?
 5 A Yes, I have. Uh-huh.
 6 Q When did you first see Honeywell's patents?
 7 A During that meeting.
 8 Q The first meeting you mentioned?
 9 A Yes.
 10 Q Which patents were shown to you at that
 11 meeting?
 12 A There were two patents. One was related to the
 13 bleed control system. The second was related to
 14 starting.
 15 Q Was the second patent specifically about fuel
 16 control during starting?
 17 A Yes.
 18 Q How long did this first meeting last?
 19 A Two hours.
 20 MR. BRAFMAN: Well, let the record reflect that
 21 I intend to inquire further on this conversation if the
 22 objection is withdrawn.
 23 MR. McCracken: We appreciate the courtesy of
 24 the deferral for the moment.
 25 BY MR. BRAFMAN:

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1 And for that reason, we believe that to be
 2 privileged. I am going to instruct the witness not to
 3 answer that question and request that we have a
 4 discussion off the record about this at a time that's
 5 convenient for you whether it's now or later.
 6 MR. BRAFMAN: Well, if you are going to
 7 instruct the witness not to answer, I won't be able to
 8 proceed with the line so...
 9 MR. McCracken: Could we go off the record for
 10 a moment?
 11 MR. BRAFMAN: Surely.
 12 Let's go off the record.
 13 MR. McCracken: Okay.
 14 VIDEOGRAPHER: We're going off the record. The
 15 time is 2:41 P.M.
 16 (Discussion off the record.)
 17 VIDEOGRAPHER: We're back on the record. The
 18 time is 2:42 P.M.
 19 BY MR. BRAFMAN:
 20 Q Do you know what Honeywell is claiming in this
 21 lawsuit?
 22 A I don't know the details.
 23 Q Do you know generally what Honeywell's claims
 24 are?
 25 A Generally related to the bleed control system.

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1 Q Have you ever looked at Honeywell's patents
 2 subsequent to this first meeting with Sundstrand's
 3 lawyers.
 4 A No.
 5 Q Had you seen those patents prior to being shown
 6 them at the meeting?
 7 A No.
 8 Q Were you aware of their existence prior to the
 9 meeting?
 10 A No.
 11 Q When you were shown the patents, the Honeywell
 12 patents, at this meeting last year, did you understand
 13 what was in them?
 14 A We didn't -- we didn't take the time to review
 15 them. They asked me to review them --
 16 MR. McCracken: I ask the witness -- I instruct
 17 the witness not to divulge the communication between the
 18 attorney and -- any attorney in that meeting and the
 19 witness.
 20 BY MR. BRAFMAN:
 21 Q Sitting here today, do you have any
 22 recollection of the content of Honeywell's patents?
 23 A No.
 24 Q Was it anyone's job during the development of
 25 the APS3200 to make sure there was no infringement of

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1 other people's patents?
 2 A Not that I know of.
 3 Q Did you or anyone else subscribe to any kind of
 4 service that brought patents to your attention.
 5 A No.
 6 Q Have you ever applied for a patent?
 7 A Yes.
 8 Q Have you received any?
 9 A Yes.
 10 Q Did that relate to work you did at Sundstrand?
 11 A No.
 12 Q Was it subsequently work you did at Capstone?
 13 A Yes.
 14 Q Do you know of any patents that relate to
 15 Sundstrand APUs, Sundstrand patents?
 16 A No.
 17 Q I'm going to hand you what has previously been
 18 marked as Suttie Exhibit 14 bearing production
 19 No. HSB 215503?
 20 A Okay.
 21 Q Is Suttie Exhibit 14 another one of the
 22 Turbomeca and Sundstrand coordination memos?
 23 A Yes.
 24 Q Do you recall seeing Suttie Exhibit 14 before?
 25 A No.

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1 Q Do you know what this refers to?
 2 A No.
 3 Q Is Q23 a Sundstrand designation for a
 4 preproduction APU?
 5 A Yes. I believe it's a development unit.
 6 Q Do you believe the Q23 was a development
 7 APS3200?
 8 A Yes.
 9 Q Do you know why Turbomeca is going to be using
 10 sensors on a Garrett module?
 11 A No.
 12 Q Did anyone ever tell you that Turbomeca had
 13 tested Garrett modules in 1992?
 14 A No.
 15 Q I'm going to hand you what has been previously
 16 marked as Suttie Exhibit 11 bearing production
 17 Nos. HSA 161463 through 161476.
 18 The front page of Suttie Exhibit 11 is a copy
 19 of a file folder that says, "Garrett information."
 20 Do you see that?
 21 A Yeah.
 22 Q Do you know whose file this was?
 23 A Are you asking do I recognize the handwriting?
 24 I don't know.
 25 Q Okay.

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1 Q Suttie Exhibit 14 refers in the middle to
 2 traces of GTCP 331-3050 nineteen holes.
 3 Do you see that?
 4 A Yes.
 5 Q Do you have any idea what that refers to?
 6 A No.
 7 Q Does the nineteen holes mean anything to you?
 8 A No.
 9 Q I'm going to hand you what has been previously
 10 marked as Suttie Exhibit 10 bearing production
 11 No. HSB 215488.
 12 A Okay.
 13 Q And Suttie Exhibit 10 is another coordination
 14 memo?
 15 A Yes.
 16 Q Do you recall ever seeing Suttie Exhibit 10
 17 before?
 18 A No.
 19 Q The first sentence of Suttie Exhibit 10 states:
 20 "The unstationary sensors which are
 21 going to be used on the Garrett modules
 22 and Q23 have a transient frequency
 23 response of 3000 hertz."
 24 You see that?
 25 A Yes.

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1 A I can only speculate on whose it is.
 2 Q What would be your best guess?
 3 MR. McCracken: Objection. Speculative.
 4 THE WITNESS: I don't know.
 5 BY MR. BRAFMAN:
 6 Q Okay. Looking at the second page of Suttie
 7 Exhibit 11, on the left hand, there's a handwritten list
 8 of names under "Peg copy" and one of them is Edelman.
 9 Do you see that?
 10 A Yes. Uh-huh.
 11 Q Do you recall receiving this document beginning
 12 on the second page of Suttie Exhibit 11?
 13 A Yes, I do.
 14 Q What is your understanding of what this
 15 document is in Suttie Exhibit 11?
 16 A It looks like a -- a presentation for the
 17 GTCP330.
 18 Q 330?
 19 A Well, I am just looking through here. 331 it
 20 says.
 21 Q What is the GTCP331?
 22 A It's a AlliedSignal APU.
 23 Q Is this a AlliedSignal presentation or a
 24 Sundstrand presentation?
 25 A It's not a Sundstrand.

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1 Q Do you know how Sundstrand got it?
 2 A No.
 3 Q Did you receive this presentation about the
 4 Honeywell APU in 1992?
 5 A I don't remember the exact date.
 6 Q If you look at the second page of Suttie
 7 Exhibit 11, the cover page for the fax is dated
 8 November 12, 1992.
 9 Is that consistent with your memory of when you
 10 received it?
 11 A My -- I just don't have a memory of when I
 12 received it. That's what the date says but...
 13 Q Do you have any reason to believe it's wrong,
 14 the date?
 15 A I have no reason to believe it's wrong, no.
 16 Q When you received the document of Suttie
 17 Exhibit 11, was it your understanding that this was
 18 confidential AlliedSignal information?
 19 A No. It wasn't marked anywhere.
 20 Q What did you -- let me start again.
 21 Did you read the exhibit when you received it?
 22 A Yes.
 23 Q What were you told to do with the information
 24 in Suttie Exhibit 11?
 25 A I don't recall.

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1 A Yeah, it says that they work together.
 2 Q Do you agree that the surge control system is a
 3 vital part of the APU?
 4 MR. McCracken: Objection. Ambiguous.
 5 THE WITNESS: Yeah, could you be more specific?
 6 BY MR. BRAFMAN:
 7 Q Sure.
 8 Well, this page does more than say that the
 9 surge control system works with the compressor. It's
 10 attempting to -- to explain that the surge control
 11 system is particularly important to the APU; wouldn't
 12 you agree?
 13 A Yes. Uh-huh.
 14 Q Do you agree that that's true?
 15 A Yes. Uh-huh.
 16 Q On the page of Suttie Exhibit 11 with the
 17 No. 161471.
 18 A Okay.
 19 Q There's a block diagram there.
 20 A Yes.
 21 Q Is it your understanding that this diagram
 22 relates to the way the surge control system works in the
 23 AlliedSignal or Honeywell APU, the 331 series?
 24 A Yes.
 25 Q Didn't you believe that the information on this

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1 Q Did you learn anything from Suttie Exhibit 11?
 2 MR. McCracken: Objection. Ambiguous.
 3 THE WITNESS: Did I learn anything? I
 4 suppose -- you mean, you learn anything from anything
 5 you read so...
 6 BY MR. BRAFMAN:
 7 Q Did you learn anything specific about surge
 8 control from this document?
 9 MR. McCracken: Objection. Ambiguous.
 10 THE WITNESS: About surge control, I wouldn't
 11 say so, no.
 12 BY MR. BRAFMAN:
 13 Q On the third page of the Honeywell presentation
 14 with the title of "Customer Buys Compressor," there's a
 15 list of points all under the heading "Customer Buys
 16 Compressor and Surge Control System" together.
 17 A Okay.
 18 Q Do you agree with the -- with that point being
 19 made in this page?
 20 A Let me read what it says here.
 21 None of it was useful to me.
 22 Q I'm not asking whether it was useful. But I
 23 guess, would you summarize the point of this page as
 24 being that the surge control system is a vital part of
 25 the APU?

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1 page would be considered confidential by Honeywell?
 2 MR. McCracken: Objection. Ambiguous. And
 3 vague.
 4 THE WITNESS: I had no way of knowing.
 5 BY MR. BRAFMAN:
 6 Q Well, when you and the other Sundstrand
 7 engineers received this page, isn't it true that you
 8 realized you got information here that isn't normally
 9 publicly available?
 10 A Yes.
 11 MR. BRAFMAN: We have three minutes left on the
 12 videotape, so let's take a break.
 13 VIDEOGRAPHER: This is the end of tape 2 in the
 14 deposition of Ed Edelman. We're going off the record.
 15 The time is 2:59 P.M.
 16 (Recess.)
 17 VIDEOGRAPHER: We're back on the record. The
 18 time is 3:18 P.M. This begins tape 3 in the deposition
 19 of Ed Edelman.
 20 BY MR. BRAFMAN:
 21 Q While you were at Sundstrand, did you ever
 22 submit or consider applying for a patent on anything you
 23 were working on?
 24 A Yes.
 25 Q Did that relate to a fuel control algorithm?

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1 A It was a fuzzy logic control, and I don't
2 remember what it was applied to. It was never granted,
3 a patent.

4 Q Was that control something you developed at
5 Sundstrand?

6 A It was never put into production or anything
7 like that.

8 Q Did you consider it for the APS3200?

9 A No.

10 Q For what project was it considered?

11 A You know, I don't - I don't recall.

12 Q I've seen documents referring to close loop
13 control and open loop control. Do you know what those
14 terms mean?

15 A Yes.

16 Q Can explain them?

17 A Close loop control means you measure a
18 parameter, and it's fed back into a control system.

19 Open loop means that there's no measure
20 parameter. It means like it's an estimate or a guess.

21 Q I'm going to show you what's been previously
22 marked as Suttie Exhibit 50 bearing production.
23 Nos. HSA 455702 through -761.

24 Do you recognize Suttie Exhibit 50?

25 A Yes.

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1 A Various closed loop control loops. There's
2 start control, steady-state speed control. The surge
3 and load control logic and the IGV load control.

4 Q What is the start control?

5 A The start control is the logic that commands a
6 fuel valve position to regulate the speed of the engine
7 and the temperature of the engine during the starting.

8 Q Did you determine the logic for starting the
9 engine?

10 A It was pretty much in place when I started. So
11 I may have had some things to do with refining the
12 logic, getting the gains right.

13 Q Do you know who it was that did the initial
14 work on the logic for fuel control at startup?

15 A No.

16 Q Someone just handed you the file or whatever
17 and told you to keep working on it?

18 A Well, I - it was a number of people that
19 preceded people. I don't know who exactly did what. So
20 I can't answer specifically.

21 Q In the upper left hand corner on page 19 of
22 Suttie Exhibit 50, and by the start control, all the way
23 on the left it says "PERSPD."

24 What does that stand for?

25 A Percent engine speed.

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1 Q What is it?

2 A It's a - let me figure this out. It's a model
3 of the surge logic to determine the stability of the
4 loop so it's based on a simulation.

5 Q Who did the simulation model?

6 A I did.

7 Q When did you model the surge logic for the
8 APS3200?

9 A I don't know the exact date. But it shows
10 March 23, 1992 is when this document was prepared.

11 Q Why did you model the surge logic around that
12 time?

13 A It was a requirement of the customer. They
14 asked us to do it.

15 Q What were you - what was the customer looking
16 for?

17 A What they really wanted was a simulation of our
18 engine.

19 Q Did the customer indicate it was worried about
20 anything in particular with respect to the engine
21 design, the APU design?

22 A No.

23 Q Can you turn to page 19 of Suttie Exhibit 50?

24 A Okay.

25 Q What's shown on page 19 of Suttie Exhibit 50?

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1 Q Does that indicate that percent engine speed is
2 an input to this control?

3 A Yes.

4 Q Right below that there's a line that says,
5 "Time." What does that signify?

6 A It is the engine speed setpoint as a function
7 of time.

8 Q Is the engine speed setpoint the desired engine
9 speed at a given time?

10 A Yes.

11 Q What does the control do with this time input
12 in the setpoint schedule there?

13 MR. McCracken: Objection. Speculative.

14 THE WITNESS: What does the engine do? It -
15 BY MR. BRAFMAN:

16 Q How does - let me rephrase the question.
17 What is the time input being used for here?

18 A Varying the speed setpoint.

19 Q Why do you want to vary the speed setpoint?

20 A Because you need to accelerate the engine to
21 start it.

22 Q How would you explain, in words, what the
23 control algorithm represented in the upper left-hand
24 corner before the start control box?

25 A How would I explain it? There is a speed

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1 command that increases as a function of time, and that
 2 is regulated by PID loop.
 3 And there is also a corresponding temperature
 4 control, and it selects the minimum of those two
 5 outputs, and that's the fuel – the command sent to the
 6 fuel control.
 7 Q In the upper left-hand corner the percent speed
 8 and timelines arrive at a circle.
 9 Does that indicate a comparison?
 10 A Yes.
 11 Q What are the two things being compared?
 12 A The speed setpoint and the speed feedback.
 13 Q The speed feedback being the actual speed of
 14 the engine?
 15 A Yes.
 16 Q And what time is being referred to? Time of
 17 what?
 18 A It's elapse time from starting.
 19 Q The elapse time since the APU started up?
 20 A Uh-huh.
 21 Q You have to say "yes" or "no."
 22 A Yes. Yes.
 23 Q Was the use of elapse time since startup in the
 24 fuel control, was that something that was part of the
 25 work that had been done before you or was that something

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1 Q Was there anybody else that you can recall
 2 besides you and Mr. Mehr-Ayin?
 3 A No.
 4 Q Did the control algorithm shown here for
 5 startup in Suttie Exhibit 50 work acceptably?
 6 A I don't recall.
 7 Q You testified earlier that you aren't aware of
 8 anyone at Sundstrand who received patents in the
 9 industry on a subscriber basis, correct?
 10 A Yeah. I wasn't aware.
 11 Q Do you know of any steps that were taken at
 12 Sundstrand to make sure that Honeywell's rights weren't
 13 infringed upon by the design that you and the other
 14 engineers were working on?
 15 MR. McCracken: Objection. Vague.
 16 THE WITNESS: No, I don't.
 17 BY MR. BRAFMAN:
 18 Q Do you know whether any of the other engineers
 19 who worked on the APS3200 formerly worked at Honeywell
 20 or AlliedSignal?
 21 A I – I wouldn't be a hundred percent positive,
 22 but I believe one or two did.
 23 MR. BRAFMAN: I'm going to mark as Edelman
 24 Exhibit 72 a one-page document entitled "Confidential
 25 Information and Invention Agreement."

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1 you came up with?
 2 A I don't recall.
 3 Q Do you recall whether the control in the
 4 APS3200 ever differed from the control pictured here or
 5 changed from the control here for the startup fuel
 6 control?
 7 A I don't recall.
 8 Q Did you ever spend any time after creating this
 9 simulation working further on the startup control for
 10 the fuel system?
 11 A Yeah, I did some work.
 12 Q Do you recall ever changing the use of time as
 13 the input?
 14 A I don't recall.
 15 Q Who would you say had primary responsibility
 16 for the startup fuel control?
 17 A It depended on the phase of the program. There
 18 was a period of time when I did work on it. There was a
 19 period of time when Korosh worked on it.
 20 Q When was the time when you had primary
 21 responsibility?
 22 A I can't give you exact dates.
 23 Q Was it before or after this simulation in
 24 Suttie Exhibit 50?
 25 A I don't recall.

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1 MR. McCracken: Do you have a production
 2 number?
 3 MR. BRAFMAN: I don't, unfortunately.
 4 MR. McCracken: Is this document one that was
 5 produced by us to you?
 6 MR. BRAFMAN: I don't think you produced it,
 7 no.
 8 MR. McCracken: If the confidentiality – or
 9 I'm sorry, the protective order in this matter specifies
 10 that you have to give us five days' notice if you wish
 11 to show a witness your own documents.
 12 Is this your own document?
 13 MR. BRAFMAN: I'm pretty sure it's from our
 14 files. It's a document that I believe Mr. Edelman had
 15 signed at one point so I'm sure he has seen it before.
 16 MR. McCracken: Notwithstanding that, the terms
 17 of the protective order require that we be given five
 18 days' notice before you use your own document with the
 19 witness.
 20 BY MR. BRAFMAN:
 21 Q Let me get at this way: Mr. Edelman, when you
 22 worked at AlliedSignal did you sign a confidentiality
 23 agreement?
 24 A I believe so, yes.
 25 Q And did the confidentiality agreement you had

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1 entered into with AlliedSignal provide that when you
2 left the company you were required to maintain the
3 Honeywell confidential information as confidential and
4 not share it with others?

5 A Yes.

6 Q Did anyone at Sundstrand take any steps to make
7 sure that you and any other former Honeywell employees
8 didn't, whether intentionally or unintentionally, use
9 confidential information they had learned while working
10 at Honeywell during development of Sundstrand
11 technology?

12 MR. McCracken: Objection. Vague.

13 THE WITNESS: No one told me -- it was just
14 understood.

15 BY MR. BRAFMAN:

16 Q Was there any explicit conversations about
17 confidential information you might have had from prior
18 employers like Honeywell?

19 A No.

20 Q Your managers or bosses or anyone never raised
21 the issue of making sure confidential information didn't
22 get used?

23 A No.

24 MR. McCracken: If you are finished with this
25 exhibit, I'd ask that it be withdrawn pursuant to the

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1 A Yes.

2 Q The software versions, or rather
3 specifications -- let me restart that.

4 The software specifications for the APS series
5 3200 have letters I've seen, is that correct, A, B, C?

6 A Revision letters, yes.

7 Q How did those revision letters relate to
8 software versions? Is there a correlation?

9 A I can't recall.

10 Q Was there any kind of a documentation kept of
11 what software version related to what specification?

12 A I can't recall.

13 MR. BRAFMAN: Well, Mr. McCracken, if there are
14 any documents that relate to specification versions and
15 software versions and actual production APUs and it
16 hasn't been produced, we would request it.

17 MR. McCracken: I believe all of those
18 documents have been produced, but we'll look into that.

19 MR. BRAFMAN: Mr. McCracken, I believe
20 essentially the remaining questions I have relate to the
21 conversation that Mr. Edelman had with the Sundstrand
22 attorneys many months ago as well as to the
23 specification.

24 Is there --

25 MR. McCracken: Why don't we take up the first

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1 terms of the protective order.

2 MR. BRAFMAN: I will take it away.

3 MR. McCracken: Thank you.

4 (Exhibit withdrawn.)

5 BY MR. BRAFMAN:

6 Q Did you know a Branch Crooks?

7 A Yes.

8 Q Who is he?

9 A He was -- he worked at AlliedSignal as well as
10 Sundstrand.

11 Q Did you know him at both places?

12 A Yes.

13 Q Did Mr. Crooks have any role in the development
14 of the APS3200 control?

15 A Yes, he did. Sure.

16 Q What did Mr. Crooks do regarding the APS3200?

17 A I can't give you specifics.

18 Q Did you know that Allen Greubel had worked at
19 AlliedSignal before he came to Sundstrand?

20 A Yes.

21 Q Did you know that Terry Meche also did so?

22 A Yes.

23 Q When Sundstrand was interviewing you, did
24 they -- did Sundstrand know that you were working at the
25 time at AlliedSignal?

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1 one and ask your questions of the witness with respect
2 to the meeting.

3 And depending upon the witness's responses,
4 then I will instruct accordingly.

5 MR. BRAFMAN: Okay.

6 Q Remind me, when was the initial meeting you had
7 with Sundstrand lawyers?

8 A Six months to a year ago.

9 Q And it was somewhere in California?

10 A Yes.

11 Q Was it at your office?

12 A No. It was at a hotel.

13 Q Was that a hotel where the Sundstrand lawyers
14 were staying?

15 A I don't know if they were staying there.

16 Q But they arranged to meet you there?

17 A Yeah.

18 Q Was Mr. McCracken there?

19 A No.

20 Q Do you recall the names, first or last, of any
21 of the participants in the meeting?

22 A No.

23 Q How many people were there besides you?

24 A Two.

25 Q Do you know if either of them were employees of

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1 Sundstrand?
 2 A No.
 3 Q No, you don't know?
 4 A I don't know.
 5 Q What did -- how did the meeting get set up?
 6 Did they call you?
 7 A Yes. And on the phone call they asked if -- if
 8 I wanted to be represented by -- by Sundstrand. And I
 9 answered yes.
 10 Q Well, let's back up because I'm not sure we're
 11 talking about the same thing.
 12 In the very first meeting you had with the
 13 lawyers, you told me earlier today when you testified
 14 that you at that time were not represented by
 15 Sundstrand's lawyers, correct?
 16 A Yeah, I kind -- I misunderstood. I -- I
 17 thought that there would be some kind of formal
 18 agreement. But they just asked and I said yes, that I
 19 would.
 20 Q Well, when I asked you earlier in your
 21 deposition about whether you were represented by
 22 Sundstrand's lawyers and you testified under oath
 23 simply, "No," why didn't you relay that conversation to
 24 me before?
 25 A Well, I thought -- I thought it meant, you

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1 of any confidentiality or any provision of the
 2 protective order in this matter is intended nor is it
 3 conveyed.
 4 We also would like the witness to state on the
 5 record that he agrees that anything he learns from this
 6 document that he doesn't already know and that he would
 7 be discovering in the course of reviewing this document
 8 inasmuch as it has materials that postdate the date of
 9 his leaving employment of Sundstrand, that he would
 10 maintain that in confidence.
 11 THE WITNESS: Yes, I will.
 12 MR. BRAFMAN: We'll get to that in a minute.
 13 Just one or two other questions.
 14 Q Do you know of any APU or any other compressor
 15 based system prior to 1980 that took the position of
 16 inlet guide vanes into account when controlling the
 17 bleed valve?
 18 MR. McCracken: Objection. Ambiguous.
 19 THE WITNESS: Prior to 1980?
 20 MR. BRAFMAN: Yes.
 21 THE WITNESS: No.
 22 BY MR. BRAFMAN:
 23 Q Given that you testified earlier you don't know
 24 what's in -- in Honeywell's patents, I take it you have
 25 no opinion on whether the APS3200 infringes the

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1 know, taking place in a meeting, you know, in a
 2 deposition back -- you know, this was past tense.
 3 So I didn't quite understand, when you say,
 4 "representing" were -- you know, when does the
 5 representation take place. They asked me if I wanted to
 6 be represented, and I said yes.
 7 Q They actually asked you that question?
 8 A Yes.
 9 Q Before you met with them?
 10 A Yes.
 11 Q Well, if that's your testimony now, that's what
 12 we'll have to take.
 13 MR. BRAFMAN: Let's go off the record.
 14 MR. McCracken: We still don't have an answer.
 15 VIDEOGRAPHER: We're off the record. The time
 16 is 3:45 P.M.
 17 (Recess.)
 18 VIDEOGRAPHER: We're back on the record. The
 19 time is 3:58 P.M.
 20 MR. McCracken: Just like to make a statement
 21 for the record that Mr. Braffman has tendered Suttle
 22 Exhibit 9 to the witness.
 23 Pursuant to stipulation between the parties, we
 24 have agreed that the document may be used by Mr. Braffman
 25 for questioning of this witness only and that no waiver

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1 Honeywell patents?
 2 MR. McCracken: Objection. It's based -- this
 3 is a lay witness not a legal expert.
 4 THE WITNESS: No opinion.
 5 BY MR. BRAFMAN:
 6 Q And similarly, I take it you have no opinion on
 7 whether Honeywell's patents are valid or invalid?
 8 MR. McCracken: Same objection.
 9 THE WITNESS: No opinion.
 10 BY MR. BRAFMAN:
 11 Q Okay. Let's turn to Suttle Exhibit 9, the
 12 "3200 Control Specification, Revision N," as in Nancy.
 13 Turn to the third page of Exhibit 9, the bottom
 14 right-hand corner is a stamp of an M with a circle?
 15 A Yes.
 16 Q Do you know what that signifies?
 17 A No.
 18 Q Did you draft the entire Exhibit 9?
 19 A No.
 20 Q Who else helped you with it?
 21 A Korosh and Alan Greubel at times worked on it.
 22 Q Were you the primary author of Exhibit 9?
 23 A For a period of time, yes.
 24 Q What period of time?
 25 A I can't give you specific dates. But basically

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1 from the time I arrived to the time I left.
 2 Q Turn to page 17 of Suttie Exhibit 9.
 3 A Okay.
 4 Q There's a heading in the middle of the page
 5 entitled "Corrected bleed airflow calculation."
 6 You see that?
 7 A Yes.
 8 Q Is this corrected bleed airflow calculation the
 9 calculation that is used in the load compressor pressure
 10 ratio part of the control?
 11 A This is -- this is the algorithm that took the
 12 place of the B-factor.
 13 Q Do you know whether you drafted this algorithm?
 14 A I don't recall.
 15 Q In the algorithm written as an FL statement,
 16 there's two possibilities either selecting the lower
 17 value of flow or the higher value of flow.
 18 What are those referring to, the low and high
 19 value of flow?
 20 A The high value is the choke region of airflow.
 21 The low value, we discussed that.
 22 Q Okay. Do you know whether any of these
 23 parameters used to calculate the bleed airflow,
 24 corrected bleed airflow, is a function of the inlet
 25 guide vane position?

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1 A If -- it would be in the specification.
 2 Q Let's turn to figure 12B, which is at page 129.
 3 On page 129 of Suttie Exhibit 9 there's a
 4 heading "Surge Control Choked Flow Compensation Logic."
 5 What is this logic being shown? What does that
 6 mean?
 7 A It's the logic that defines which side of the
 8 curve you are on.
 9 Q Okay. So this is how the -- the pressure ratio
 10 is actually implemented in the 3200?
 11 A Yes.
 12 Q In the logic shown on page 129, figure 12B,
 13 there are two places where inlet guide vane position is
 14 an input; is that correct?
 15 A Yes.
 16 Q Can you explain what the bottom inlet guide
 17 vane position does?
 18 A Yeah. I think -- if your inlet guide vane is
 19 less than 20 percent it always assumes that you have a
 20 low flow condition.
 21 Q And how is the inlet guide vane position used
 22 in its second place as an input in figure 12B?
 23 A Up here?
 24 Q Yes. In the middle of the logic diagram.
 25 A The inlet guide vane position effects the

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1 A I don't recall.
 2 Q There's a reference in this section to a
 3 Table 7. Would you know where those tables are located?
 4 A They aren't in here?
 5 Q I do. I just found it.
 6 A Okay.
 7 Q It's page 99.
 8 A Okay.
 9 Q Can you explain what this is showing on
 10 page 99?
 11 A Yeah. It's the corrected bleed airflow as a
 12 function of delta P over P, and the first column is for
 13 low flow conditions and the second column is for high
 14 flow.
 15 Q So the first column refers to being on the left
 16 part of the upside down U and the right column is on the
 17 right side?
 18 A Uh-huh. Yes.
 19 Q How would one determine whether any of the
 20 parameters used to calculate the corrected bleed airflow
 21 are calculated as a result of inlet guide vane position?
 22 MR. McCracken: Objection. Speculative.
 23 THE WITNESS: How would one know?
 24 BY MR. BRAFMAN:
 25 Q Yes.

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1 setpoint for the P7 over P2.
 2 Q And the P7 over P2 is the replacement of the
 3 B-factor?
 4 A Yes.
 5 Q There's a long equation right under this inlet
 6 guide vane position graph.
 7 A Yes.
 8 Q Is this a calculation that is actually done by
 9 the APS3200 in controlling the bleed valve?
 10 A Yes.
 11 Q And am I correct, then, that the APS3200
 12 controls the bleed control valve as a function of the
 13 inlet guide vane position?
 14 MR. McCracken: Objection. Ambiguous and
 15 vague.
 16 THE WITNESS: It -- it makes the decision on
 17 whether to control or not to control. That's the way I
 18 would define it.
 19 If it's on the left-hand side of the curve,
 20 which is defined by this, this equation, then the logic
 21 says to control it. Otherwise, you don't control. You
 22 set an open loop position.
 23 BY MR. BRAFMAN:
 24 Q When you say "open loop," it's not the same
 25 open loop you talked about before about there being --

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1 or is it about there being a variable fed back on
2 itself?
3 A Yeah. It's just a fixed position. We tell the
4 bleed valve to open all the way.
5 Q And that signal remains in stay open?
6 A Yes.
7 Q Would you agree, then, you are controlling the
8 valve but you are controlling it by telling it to just
9 stay open?
10 A I guess in my purest definition of control, I
11 wouldn't say -- I wouldn't say that's what you are not
12 controlling. You are commanding a fix position.
13 Q What's the purest definition of control?
14 A In close loop control, you have a feedback
15 sensor.
16 Q Isn't there a feedback here in the guide vane
17 position being the feedback?
18 A Yeah. But I -- what I am saying is if you --
19 in a high flow region, then you don't use the delta
20 P over P feedback.
21 Q But you do continue to use the inlet guide vane
22 position feedback, correct?
23 A Well, it's constantly measuring it. Sure.
24 Q And as long as the inlet guide vane position is
25 at a certain value, the bleed valve will remain all the

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1 that in control theory the logic shown on figure 12B
2 would also be considered a control?
3 A Yeah. Control but not a close loop control
4 parameter.
5 Q Do you recall the APS3200 functioning the way
6 it's pictured in figure 12B?
7 A Yeah.
8 Q I asked because you earlier testified you
9 couldn't remember how the guide vane position got used
10 in the bleed control valve.
11 Does seeing figure 12B remind you that, yes,
12 you knew this is the way it worked, or are you just
13 interpreting what you see in the document?
14 A I am interpreting what I see in the document.
15 Q And you can't recall -- you can't put yourself
16 back in 1995 and remember how it worked?
17 A That's correct.
18 Q Do you know when the APS3200 began functioning
19 as pictured in figure 12B?
20 A No.
21 Q Is it possible it functioned that way ever
22 since it became a commercial product?
23 A It's possible.
24 Q You just don't know?
25 A I don't know.

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1 way open, correct?
2 A As long as the P7 over P2 value has a certain
3 value it will be, and that value is a function of the
4 IGV position.
5 Q So in the end, would you agree that there is a
6 feedback close loop here that results in the bleed valve
7 being kept open?
8 MR. McCracken: Objection. Vague.
9 THE WITNESS: Yeah. It -- my definition is a
10 little different. But it does feedback IGV position and
11 to find whether to control or not to control.
12 BY MR. BRAFMAN:
13 Q Can you articulate how your definition of
14 control would exclude this logic?
15 A Well, when I think of the bleed control, I
16 think of delta P over P as being the control factor and
17 not IGV position.
18 Q But there's no control theory requirement that
19 requires this to be considered not control, correct?
20 A There's no control theory?
21 MR. McCracken: Objection. Vague.
22 MR. BRAFMAN: That's a poorly worded question.
23 Let me withdraw it.
24 Q Am I correct that although you think of the
25 bleed valve control as being the delta P over P logic,

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1 Q Can you turn to page 23 of the specification?
2 A Sure.
3 Q Okay. In the center of page 23 of Suttie
4 Exhibit 9, there's a section called "Delta pressure"?
5 A Yes.
6 Q Is this the specification for the measurement
7 that gives you delta P over P?
8 A This really defines how it is transmitted to
9 the aircraft.
10 Q To the aircraft?
11 A The aircraft computer.
12 Q Why does the aircraft computer want to know
13 about the delta pressure?
14 A Let me see. It was a requirement by the
15 manufacturer.
16 Q What is ARINC, A-R-I-N-C?
17 A ARINC?
18 Q Yes.
19 A It's a communication protocol.
20 Q Is that the communication protocol used with
21 the aircraft?
22 A Yes.
23 Q Is it also used internally within the APU?
24 A No.
25 Q So anything that talks about an ARINC is going

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1 to be a communication with the aircraft?
 2 A Yes.
 3 Q Can you turn to page 51?
 4 There's a section at page 51 of Suttie
 5 Exhibit 9 entitled "Load Compressor Surge Detection and
 6 Bleed Control Valve Failure."
 7 Do you see that?
 8 A Yes.
 9 Q And the second paragraph there is a reference
 10 to KR1 that we saw earlier today.
 11 Do you see that?
 12 A Yes.
 13 Q From this paragraph, can you tell any more
 14 about what KR1 is?
 15 A Yeah. It's -- it's a setpoint. And if -- if
 16 it's less than that setpoint for a period of time, then
 17 the bleed control valve logic is closed and a compressor
 18 surge fault is declared, that's sent to the aircraft.
 19 Q Do I understand that when delta P over P drops
 20 below this number, it assumed that the APU is in surge?
 21 A Yes.
 22 Q Can you turn to page 61 of Suttie Exhibit 9?
 23 A Okay.
 24 Q There's a section called "Close Loop
 25 Acceleration Control for Starting."

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1 algorithm for startup?
 2 A No.
 3 Q Do you recall if the algorithm or logic shown
 4 on page 61 of Exhibit 9 gave different performance to
 5 the startup than the logic shown in Exhibit 50?
 6 A I -- I don't recall.
 7 Q Do you know who it was that was -- is most
 8 familiar with the specific logic shown on page 61 of
 9 Exhibit 9?
 10 A Who is most familiar? I would say that Korosh
 11 and I were probably equally familiar.
 12 Q But you just don't remember anything about it?
 13 A No. I don't remember why it was changed.
 14 Who -- who decided to change it.
 15 Q Do you recall there being any problems with the
 16 algorithm shown on Exhibit 50 for startup fuel control?
 17 A No.
 18 Q In Exhibit 50, the algorithm shown for startup
 19 fuel control relied upon time elapse from engine
 20 startup, correct?
 21 A Yes.
 22 Q Does the 3200 shown or the 3200's control shown
 23 here relate at all to time elapsing?
 24 A No.
 25 Q What is N dot mean?

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1 Do you see that?
 2 A Yes.
 3 Q Does this relate to the startup fuel control
 4 that we looked at in Suttie Exhibit 50 in your design
 5 verification?
 6 A No. It's -- it's different.
 7 Q Is it -- does this replace what's shown in
 8 Exhibit 50 or is this simply a different control
 9 unrelated?
 10 A It replaces it.
 11 Q Do you recall anything about the replacement of
 12 the control in Exhibit 50 with what's shown on page 61
 13 in Exhibit 9?
 14 A Do I recall the circumstances or...
 15 Q Anything. How it got to be that the control
 16 pictured on -- or described on page 61 of Exhibit 9 is
 17 now different than what was in Exhibit 50.
 18 A I don't -- I don't recall why or why it
 19 happened.
 20 Q Do you understand how the control works on page
 21 61?
 22 A Yes.
 23 Q Did you write that control logic?
 24 A I don't recall.
 25 Q Do you recall who initiated the change of the

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1 A It's rate-of-change of acceleration. Excuse
 2 me, Rate-of-change of speed.
 3 Q So you have -- you have moved from speed to the
 4 rate-of-change of speed?
 5 A Yes.
 6 Q So you still need to -- let me take that back.
 7 To determine the rate-of-change, do you need to
 8 keep track of time?
 9 A No.
 10 Q Well, how do you determine a rate if you don't
 11 keep track of time?
 12 A Well, you have a rate setpoint and a rate
 13 feedback. The only time that's entered into the
 14 equation is the update rate of the control algorithm
 15 which is 20 milliseconds. So the -- we keep track of
 16 the update rate which never changes.
 17 It's -- it's -- I don't know if I would say
 18 it's time or elapse time. Doesn't really relate.
 19 Q Do you know whether using the rate-of-change in
 20 speed gives a different result in the way the engine
 21 starts up than using elapse time?
 22 A Does it give it a different result?
 23 MR. McCracken: Objection. Vague and
 24 ambiguous.
 25 THE WITNESS: Yeah, I would say you would get a

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1 different result.

2 BY MR. BRAFMAN:

3 Q Why?

4 A I think it's a more precise control. You
5 are – you define how fast you want the engine to
6 accelerate at a given time, and it tries to meet that
7 demand.

8 Q How do you know that it gives a different
9 result?

10 A It – it's a close loop control. The elapse
11 time algorithm just simply changed the setpoint as a
12 function of time. If the engine – if the engine fell
13 behind or wasn't able to keep up, the control had no way
14 of knowing that.

15 Q Have you ever compared the results of the fuel
16 startup under the algorithm in Exhibit 50 with the one
17 in Exhibit 9?

18 A No.

19 Q So you are stating now that the result is
20 different could in fact not turn out to be true?

21 MR. McCracken: Objection. Speculative.

22 THE WITNESS: Could it turn out not to be true?

23 BY MR. BRAFMAN:

24 Q What I am trying to say is, you are guessing
25 that they are different but you don't really know

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1 A Yes.

2 Q What is ZOH?

3 A That's a zero order hold. That's just the
4 digitalization of the signal so when it passes through
5 the control you have a microprocessor base control that
6 updates that at a given rate, that defines the rate.

7 Q Is the delta P signal an analog signal?

8 A Yes, it is.

9 Q So when – the ZOH is – conforms analog to the
10 digital conversion?

11 A Yeah. It's the sampling rate.

12 Q Does the next box N and then the /D signify
13 division?

14 A Yes.

15 Q Below the delta P over P is a – is the surge
16 setpoint.

17 Do you see that?

18 A Yes.

19 Q And there's both a graph shown and a table.

20 Do you know how it is actually implemented in
21 the APS3200?

22 A Well, this tells me that it's a function of
23 inlet temperature, the surge setpoint.

24 Q And is that something that you had ever seen
25 before?

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1 because you haven't tested them and compared them,
2 correct?

3 A I haven't compared them.

4 Q What's an LCD static pressure transducer, and
5 referring to page 62 of Exhibit 9?

6 A Load compressor discharge static pressure
7 transducer.

8 Q Is a transducer a probe?

9 A It –

10 Q Is a transducer a sensor?

11 A It's a sensor.

12 Q Who is it that determined what type of sensors
13 to use and where to put them in measuring pressure or
14 flow in the – in the APS3200?

15 MR. McCracken: Objection. Ambiguous.

16 THE WITNESS: Korosh did.

17 BY MR. BRAFMAN:

18 Q Could you to turn to figure 12A on page 128 on
19 Suttie Exhibit 9?

20 A Okay.

21 Q Figure 12A is part of the bleed valve control
22 algorithm?

23 A Yes.

24 Q The delta P in the upper left-hand corner,
25 "DELP," goes to a box labeled "ZOH"?

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1 A Yes. I saw that before.

2 Q Well, I asked you earlier today about whether
3 you had known of the surge setpoint being a function of
4 temperature, and I believe you said you didn't.

5 A Yeah, I just – once this refreshed my memory.
6 Looking at the document.

7 Q What – when did the APS3200 begin changing the
8 surge setpoint as a function of temperature?

9 A I don't know the date.

10 Q Approximately.

11 A No.

12 Q Do you know if it was in the beginning of the
13 commercial production?

14 A No.

15 Q Do you know any more other than that it was as
16 of the date of this document?

17 A No, I don't know.

18 Q Why did the Sundstrand – let me rephrase the
19 question.

20 Why is the surge setpoint being controlled here
21 as a function of temperature?

22 A To – to improve – to make a constant surge
23 margin so...

24 Q Why is temperature being used to accomplish
25 that?

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Edward C. Edelman

July 10, 2000

1 A The surge line is affected by temperature.
 2 Q How do you know that?
 3 A That is most likely what was defined by
 4 Turbomeca since they are the — you know, they are the
 5 experts.
 6 Q They are the experts in what?
 7 A In compressor technology.
 8 Q Did they explain to you why they choose to use
 9 temperature as opposed to anything else that causes the
 10 surge line to vary?
 11 A I can't recall.
 12 Q Is there a table of temperature and setpoint in
 13 the 3200 software?
 14 A Yes.
 15 Q And are the values shown here all the values or
 16 the actual code, is there a more detailed longer table?
 17 A I don't recall.
 18 Q What — which of the components shown on page
 19 128 of Suttie Exhibit 9 are part of the proportional
 20 control?
 21 A The KPSWLD high and low, those are the dual
 22 gains.
 23 Q And what is the box just prior to that? One
 24 minus Z, the power minus one signify?
 25 A Yes. That's a — what's called a Z

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1 Q And does this logic show what happens at high
 2 gain?
 3 A It — it describes the logic adequately.
 4 Q Well, what does happen at high gain?
 5 A The valve reacts faster.
 6 Q What is shown in the upper right-hand corner of
 7 the surge control with the LD DES2.
 8 A That's — it's shown on a different figure but
 9 it prevents integral wind up.
 10 Q What is integral wind up?
 11 A The integrator — if the output of the BCVCTL,
 12 so that's the control setpoint, is operating at a limit,
 13 you need to take precautions to prevent the integral
 14 path from winding up.
 15 Q What does "winding up" mean?
 16 A It means that — that the value keeps
 17 increasing and increasing, and then if you come off the
 18 setpoint then the value has to wind down.
 19 So it's — it's a method to make the — to make
 20 the control more responsive when operating on a control
 21 limit.
 22 Q And that's what figure 12C on page 130
 23 concerns?
 24 A Yes.
 25 Q What is the logic on figure 12D on page 131 of

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1 transformation. So it's — it's an implementation of a
 2 time — time domain function like a PI control loop in
 3 the Z domain. Z domain is a digital functionality.
 4 Q Is that box part of the proportional control?
 5 A Yes.
 6 Q What part of the logic shown here is the
 7 integral controller?
 8 A KISWLD.
 9 Q What does that stand for?
 10 A That's — K stands for gain. I is integral. I
 11 don't know what — recall what SWLD means.
 12 Q And does the boxes at the very top of the surge
 13 control box on page 128 of Suttie Exhibit 9 signify that
 14 there's still two different setpoint gains?
 15 A Two different proportional gains.
 16 Q Proportional gains?
 17 A Yes. And there's — if you go below the
 18 setpoint minus .01, then it increases the gain. So it
 19 was changed to just a constant offset.
 20 Q Can you explain that?
 21 A If your surge setpoint, let's say was — let's
 22 say that your ambient temperature is 59 degrees, your
 23 surge setpoint according to this is .215. If it fell to
 24 .205 for two consecutive samples, then the gain would
 25 switch from the low gain to the high gain.

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1 Suttie Exhibit 9 meant to do?
 2 A It identifies the maximum and the minimum
 3 hardware limits of the LCDT, which is the feedback of
 4 the actual bleed control valve position and does a
 5 calibration.
 6 MR. BRAFMAN: Okay. Let's go off the record.
 7 VIDEOGRAPHER: We're off the record. The time
 8 is 4:39 P.M.
 9 (Recess.)
 10 VIDEOGRAPHER: We're back on the record. The
 11 time is 4:44 P.M.
 12 BY MR. BRAFMAN:
 13 Q As shown in the specification, Suttie
 14 Exhibit 9, the control for the APS3200 takes inlet guide
 15 vane position into account when controlling the bleed
 16 valve, correct?
 17 MR. McCracken: Objection. Ambiguous and
 18 vague.
 19 THE WITNESS: It's an input to the logic. I
 20 wouldn't necessarily define it as being the control
 21 parameter, though.
 22 BY MR. BRAFMAN:
 23 Q Depending on the inlet guide vane position, the
 24 position of the bleed valve can change; wouldn't you
 25 agree with that?

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1 A It - I would - yeah, you could - you could
 2 state it that way. It can - there's a decision point
 3 on whether it's a high flow or low flow condition so the
 4 bleed valve control - the bleed valve can change.
 5 Q As a result of the inlet guide vane position?
 6 A It - I wouldn't say - I wouldn't go that far.
 7 I mean, it defines whether it's high flow or low flow,
 8 and then the delta P repeated defines the valve
 9 position.
 10 Q But as part of the -
 11 A Part of the logic.
 12 Q - as part of the logic and under the normal
 13 operation of the APU, there are times when cost of the
 14 inlet guide vane position having a certain value the
 15 position of the bleed valve changes, correct?
 16 A It defines on whether to control or not to
 17 control.
 18 Q However you want to say it, that could result
 19 in a change in the bleed valve position, correct?
 20 A Yeah. It - it indirectly can change as a
 21 result of IGV position.
 22 What causes the bleed valve to change is delta
 23 P over P though. So indirectly you could say yes.
 24 Q To put it another way, if the inlet guide vane
 25 position was not an input into the logic controlling the

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 9 I, EDWARD C. EDELMAN, do hereby declare under
 10 penalty of perjury that I have read the foregoing
 11 transcript; that I have made any corrections as appear
 12 noted, in ink, initialed by me; that my testimony as
 13 contained herein, as corrected, is true and correct.
 14 EXECUTED this _____ day of _____, 2000,
 15 at _____
 16
 17

EDWARD C. EDELMAN

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1 bleed valve and you kept track of the bleed valve
 2 position and operating the APU, you would get different
 3 results?
 4 A Yes, you would.
 5 MR. BRAFMAN: No further questions.
 6 MR. McCRACKEN: I have no questions for the
 7 witness.
 8 VIDEOGRAPHER: This concludes today's
 9 deposition of Ed Edelman. Three videotapes were used.
 10 We're going off the record. The time is 4:47 P.M.
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 3
 4 I, the undersigned, a Certified Shorthand
 5 Reporter of the State of California, do hereby
 6 certify:
 7 That the foregoing proceedings were taken
 8 before me at the time and place herein set forth; that
 9 any witnesses in the foregoing proceedings, prior to
 10 testifying, were placed under oath; that a verbatim
 11 record of the proceedings was made by me using machine
 12 shorthand which was thereafter transcribed under my
 13 direction; further, that the foregoing is an accurate
 14 transcription thereof.
 15 I further certify that I am neither financially
 16 interested in the action nor a relative or employee of
 17 any attorney of any of the parties.
 18 IN WITNESS WHEREOF, I have this date subscribed
 19 my name.
 20
 21 Dated: _____
 22
 23
 24
 25

DAYNA HESTER
CSR No. 9970

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